

II. "On the Acids contained in Crab-oil." By WILLIAM J. WONFOR, Student in the Laboratory of the Government School of Science, Dublin. Communicated by Dr. MAXWELL SIMPSON. Received March 7, 1870.

Crab-oil is obtained from the nuts of a tree named by botanists *Hylocarpus carapa*, and also *Carapa Guianensis*. The tree grows abundantly in the forests of British Guiana; the oil is prepared by the Indians, who bring it to George Town for sale. The oil is obtained from the kernels by boiling them for some time, and then placing them in heaps and leaving them for some days; they are then skinned, and afterwards triturated in wooden mortars until reduced to a paste, which is spread on inclined boards and exposed to the sun; the oil is thus melted out, and trickles into receiving-vessels.

As no investigation, so far as I have been able to ascertain, has ever been made of the acids contained in this oil, Professor Galloway, to whom I am indebted for the samples of the oil, recommended me to examine them; and the examination was conducted under his direction.

The oil was in the state in which it is sold by the Indians; it possessed the appearance of a semifluid butyraceous mass, evolving a peculiar penetrating odour; its melting-point was 55° C. To obtain the acids, the oil was saponified with a solution of potassic hydrate, and the soap thus obtained dissolved in a large quantity of distilled water; to the solution sodic chloride was added in considerable excess; the soap which separated was washed and afterwards dissolved, and the solution treated with hydrochloric acid; the liberated fatty acids were collected and pressed, then melted in boiling water, and frequently washed to remove all traces of sodic chloride; the acids were again saponified, and again treated with sodic chloride, but the soda-soap was on this occasion decomposed with tartaric acid. The mixed acids had a melting-point of 40° C.

The acids were dissolved in boiling alcohol of 89 per cent.; the solution, on cooling, deposited a white radiated crystalline mass, which was repeatedly recrystallized from alcohol until it acquired a constant melting-point; it was then saponified with a solution of potassic carbonate, and the solution of the mixed potash salts was evaporated to dryness on the water-bath; the fat salt was then dissolved in absolute alcohol. The alcoholic solution, unless extremely dilute, does not crystallize on cooling, but merely forms a strong jelly, which was, after pressing, dissolved in water, and the fat acid separated by a strong solution of tartaric acid; the separated acid was washed with boiling water until all potassic tartrate and tartaric acid were removed; it was subsequently twice crystallized from absolute alcohol: its melting-point was then found to be 57° C. The acid, when pure, presents the appearance of a white glistening radiated crystalline mass: two combustions were made; the acid employed in the two analyses was obtained from two different saponifications:—

- I. .259 grm. gave .7115 CO_2 and 295 H_2O = .194 C and .0327 H.
 II. .1731 grm. gave .4748 CO_2 and .195 H_2O = .1295 C and .02168 H.
 Percentage composition :—

	I.	II.	Mean.
Carbon	74.900	74.812	74.856
Hydrogen	12.624	12.516	12.570
Oxygen	12.476	12.672	12.574
	<hr/> 100.000	<hr/> 100.000	<hr/> 100.000

These analyses, it will be seen, agree very closely with the formula for palmitic acid, $\text{C}_{16}\text{H}_{32}\text{O}_4$.

	At. weight.	Calculated percentage composition.
C_{16}	192	75.00
H_{32}	32	12.50
O_4	32	12.50
	<hr/> 256	<hr/> 100.00

Preparation of the Soda-salt.—The acid was saponified with a dilute solution of sodic carbonate, the jelly-like mass was pressed and dried, and the fat salt dissolved out with absolute alcohol; the alcoholic solution, when cold, gelatinized; the gelatinous mass was pressed, dried, and dissolved in alcohol, and filtered: this salt was not analyzed.

Preparation of the Silver-salt.—The soda-salt was dissolved in hot water and precipitated by argentic nitrate; the precipitate was washed in the dark; the analysis of this salt yielded the following results :—

- I. .2255 grm. gave .067 grm. Ag.
 II. .5088 grm. gave .152 grm. Ag.
 III. .6044 grm. gave 1.1572 grm. CO_2 and .4555 grm. H_2O = .3156 grm. C and .05061 H.
 IV. .3267 grm. gave .634 grm. CO_2 and .257 grm. H_2O = .1729 C and .02855 H.

Percentage composition :—

	I.	II.	Mean.
Carbon	52.217	52.923	52.570
Hydrogen	8.373	8.739	8.556
Oxygen	9.698	8.464	9.081
Silver	29.712	29.874	29.793
	<hr/> 100.000	<hr/> 100.000	<hr/> 100.000

The following are the calculated numbers for argentic palmitate :—

	At. weight.	Percentage composition.
C ₁₆	192	52·89
H ₃₁	31	8·54
O ₂	32	8·82
Ag	108	29·75
	<hr/> 363	<hr/> 100·00

Preparation of the Ether.—Dry hydrochloric acid gas was passed to saturation through a warm solution of the acid in absolute alcohol; the solution was then diluted with water, which caused the ether to separate as a yellowish oil, which, as it became cold, assumed the appearance of a waxy body; it was boiled with water, and afterwards agitated with a hot dilute solution of sodic carbonate; it was again dissolved in alcohol, and precipitated from this solution by water; it was then collected and dried; its analysis yielded the following results:—

I. ·2197 grm. gave ·6112 grm. of CO₂ and ·25 grm. H₂O = ·1667 C and ·0278 H.

II. ·204 grm. gave ·567 grm. of CO₂ and ·233 grm. of H₂O = ·15464 C and ·02589 H.

Percentage composition:—

	I.	II.	Mean.
Carbon	75·876	75·803	75·839
Hydrogen	12·643	12·691	12·667
Oxygen	11·481	11·506	11·494
	<hr/> 100·000	<hr/> 100·000	<hr/> 100·000

The following are the calculated numbers for ethylic palmitate, C₁₆ H₃₁ (C₂ H₅) O₂:—

	At. weight.	Percentage composition.
C ₁₈	216	76·05
H ₃₆	36	12·68
O ₂	32	11·27
	<hr/> 284	<hr/> 100·00

Preparation of the Baric Salt.—A hot alcoholic solution of the acid was saturated with ammonia in slight excess, and boiled with a solution of baric acetate; the precipitate falls as a white flocculent mass, which, when thoroughly washed, dried, and powdered, has the appearance of a glistening spongy powder.

I. ·276 grm. gave ·0625 grm. of Ba O = 23·64 per cent.

II. ·752 „ „ ·17906 „ „ = 23·81 „ „

Theory requires..... 23·65

I did not consider it necessary to make a carbon and hydrogen determi-

nation of the baric salt, or to examine any other salts of the acid, as the analysis of the acid, the silver-salt, and the ether, along with the determination of the baryta in the baric salt, I considered sufficiently indicated that the acid under examination was palmitic acid, although I could never obtain, even after fractional precipitation, a higher melting-point for the acid than 57° C.

The difference in the melting-points of the acid mass before it was treated with alcohol, and the melting-point of the palmitic acid, indicated that at least one other acid was present, but in very minute quantity.

I attempted to determine the nature of the acid of lower melting-point by exposing the residues obtained from the first three crystallizations of the hard acid to cold in a bath of sodic sulphate and hydrochloric acid, all the hard acid which crystallized out being rejected; the portion which remained fluid was saponified with potassic carbonate, and the solution of the potash soap was subjected to fractional precipitation by means of plumbic acetate; the second and smaller precipitate was collected and washed, and treated for some time at a moderate temperature with dilute sulphuric acid; this caused the separation of a reddish oily-looking liquid which was collected and dissolved in boiling alcohol; it was afterwards saponified with potassic carbonate, and the silver-salt prepared from that salt. I only obtained sufficient of the silver-salt from about 2 lbs. of oil to make one determination of the silver and one of the carbon and hydrogen, and from these determinations I did not obtain concordant results, and want of material compelled me to relinquish the further examination of the acid.

Presents received March 10, 1870.

Transactions.

Bordeaux:—Académie Impériale des Sciences, Belles-Lettres et Arts.
Actes. 3^e série, 30^e année 1868, 3^{me} trimestre. 8vo. *Paris* 1868.

The Academy.

Lisbon:—Museu Nacional. Secção Zoologica. Catalogo das Collecções Ornithologicas. Junho de 1869. 8vo. *Lisboa* 1869.

The Museum.

Newcastle-on-Tyne:—Iron and Steel Institute. Transactions, Session 1869. (Nos. 1-3.) 8vo. *Newcastle-on-Tyne* 1869.

The Secretary.

Paris:—Ecole des Mines. Annales des Mines. 2, 3, 4 livraisons de 1869. 8vo. *Paris*.

The School.

Ecole Normale Supérieure. Annales Scientifiques, par L. Pasteur. Tome VI. Nos. 2-6. 4to. *Paris* 1869.

The School.